U.S. FISH AND WILDLIFE SERVICE SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM

Scientific Name:

Pseudanophthalmus caecus

Common Name:

Clifton Cave beetle

Lead region:

Region 4 (Southeast Region)

Information current as of:

04/12/2013

Status/Action

___ Funding provided for a proposed rule. Assessment not updated.

___ Species Assessment - determined species did not meet the definition of the endangered or threatened under the Act and, therefore, was not elevated to the Candidate status.

___ New Candidate

_X_ Continuing Candidate

___ Candidate Removal

___ Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status

___ Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species

___ Range is no longer a U.S. territory

___ Insufficient information exists on biological vulnerability and threats to support listing

___ Taxon mistakenly included in past notice of review

___ Taxon does not meet the definition of "species"

___ Taxon believed to be extinct

___ Conservation efforts have removed or reduced threats

___ More abundant than believed, diminished threats, or threats eliminated.

Petition Information

___ Non-Petitioned

_X_ Petitioned - Date petition received: 05/11/2004

90-Day Positive:05/11/2005

12 Month Positive:05/11/2005

Did the Petition request a reclassification? **No**

For Petitioned Candidate species:

Is the listing warranted(if yes, see summary threats below) **Yes**

To Date, has publication of the proposal to list been precluded by other higher priority listing? **Yes**

Explanation of why precluded:

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for this species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The Progress on Revising the Lists section of the current CNOR (http://endangered.fws.gov/) provides information on listing actions taken during the last 12 months.

Historical States/Territories/Countries of Occurrence:

- **States/US Territories**: Kentucky
- **US Counties**: Woodford, KY
- **Countries**: United States

Current States/Counties/Territories/Countries of Occurrence:

- **States/US Territories**: Kentucky
- **US Counties**: Woodford, KY
- **Countries**:Country information not available

Land Ownership:

The species is known from two privately-owned sites (Clifton Cave and a small crawlway located 1 mile away) in Woodford County, Kentucky.

Lead Region Contact:

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Lead Field Office Contact:

KY ESFO, Michael Floyd, 502-695-0468, mike_floyd@fws.gov

Biological Information

Species Description:

Cave beetles in the genus *Pseudanophthalmus* are small, eyeless, reddish-brown insects. Like most other insects, they have six legs and a body that consists of a head, thorax, and abdomen. Body length is generally from 3.0 to 8.0 millimeters (0.12 to 0.32 inches). The different species within the genus are differentiated by differences in the shape and size of the various body parts, especially the shape of the male appendages (genitalia) used during reproduction. Barr (1996, p. 3) states that there are approximately 255 species in the genus *Pseudanophthalmus*.

Taxonomy:

Pseudanophthalmus caecus was described by Krekeler (1973, pp. 35-83) based upon material collected by T.C. Barr in 1963. The species belongs to the family Carabidae (ground beetles) and subfamily Trechinae. The Clifton Cave beetle is 1 of 13 species in the *P. horni* species group (Indiana, Kentucky, and Ohio) (Barr 2004, pp. 22-23).

Habitat/Life History:

The insect genus *Pseudanophthalmus* is in the predatory ground beetle family Carabidae. Most members of this genus are cave dependent (troglobites) and are not found outside the cave environment. All are predatory and feed upon small cave invertebrates such as spiders, mites, millipedes, and diplurans, while the larger Pseudanophthalmus species also feed on cave cricket eggs (Barr 1996, p. 6). Members of this genus vary in rarity from fairly common, widespread species that are found in many caves to species that are extremely rare and restricted to only one or two caves.

Little detailed life history information is available for the genus *Pseudanophthalmus*, but the generalized summary that follows is accurate for the more common and more easily studied species and is believed to also apply to the rarer species (Barr 1998, p. 3). Cave beetles copulate in the fall, and the eggs are deposited in the cave soil during late fall. The eggs hatch and larvae appear in late fall through early winter. Pupation occurs in late winter to early summer with the adult beetles emerging in early summer (Barr 1996, page 5).

The limestone caves in which the genus *Pseudanophthalmus* are found provide a unique and fragile environment that supports a variety of species evolved to survive and reproduce under the demanding conditions found in cave ecosystems. No photosynthesis takes place within the dark zone of a cave. Therefore, all organisms that are adapted to life within a cave are dependent upon energy from the surface. This energy can be in the form of leaf litter, woody debris, or small bits of organic matter that is washed or falls into the cave, or guano deposited by cave-dependent bats that feed on the surface and return to the cave to roost (Barr 1996, pp. 6-7).

Historical Range/Distribution:

The species' historical distribution consisted of only one locality - Clifton Cave, the type locality in Woodford County, KY.

Current Range Distribution:

The species is known from two sites - the type locality (Clifton Cave) and a small crawlway located about one mile from Clifton Cave - both in Woodford County, KY. Soon after the species was first collected, the entrance to Clifton Cave was closed as a result of road construction activities along KY 1964 (Clifton Road). Other caves in the vicinity of Clifton Cave were surveyed for the species during a 1995/1996 survey by Barr (1996, pp. 21-23), and one additional site was discovered. Four specimens of *P. caecus* were found in a very small, 9-meter (30-foot) long, crawlway cave about 1.61 km (1 mi) northeast of Clifton Cave (Barr 1996, p. 23). It cannot be determined at this time if the species still occurs in Clifton Cave or if the species has been extirpated from its type locality by the closure of the cave entrance. Working cooperatively in October 2008, the Kentucky Transportation Cabinet, Kentucky State Nature Preserves Commission, and KFO attempted to reopen the cave entrance to Clifton Cave. A backhoe was used to scrape away rock and dig along KY 1964, but the cave entrance was not located.

Population Estimates/Status:

Population estimates for the Clifton Cave beetle are unavailable. The entrance to Clifton Cave has been closed, so surveys in the cave are not possible. Four individuals were discovered in 1994 at a new site (small crawlway) about one mile from Clifton Cave. The site was resurveyed in 2005 by KSNPC, but no individuals were observed.

Distinct Population Segment(DPS):

N/A

Threats

A. The present or threatened destruction, modification, or curtailment of its habitat or range:

The limited distribution of the Clifton Cave beetle and other *Pseudophthalmus* species make these species vulnerable to isolated events that would only have a minimal effect on the more wide-ranging members of the genus. Events such as toxic chemical spills, discharges of large amounts of polluted water, closure of entrances, alteration of entrances, or the creation of new entrances can have serious adverse impacts on these cave beetles and could result in their extinction (Barr 1996, pp. 9-10). Caves and the species that are completely dependent upon them (troglobites) receive the energy that forms the basis of the cave food chain from outside the cave. This energy can be in the form of bat guano deposited by cave-dependent bats, large or small woody debris washed or blown into the cave, or tiny bits of organic matter that is carried into the cave by water through small cracks in the rocks overlying the cave (Barr 1996, pp. 6-7). Activities such as industrial, residential, commercial, or highway construction can, if not planned in a manner to protect caves, directly destroy caves or result in severe modification of the natural processes that maintain the sensitive biological systems they support. Pollution and chemical contamination can, under certain circumstances, result in the complete destruction of the unique life found within a cave impacted by these factors. Vandalism and trash dumping have affected some of the sites, and all of the caves are vulnerable to these activities. Loss or reduction of the supply of energy can result in the loss or severe reduction of cave beetle populations (Barr 1996, pp 16-17). Dependence upon the surface makes caves and the life found within them vulnerable to actions that take place well outside and away from the cave. Protection of caves and cave dependent species must include both the physical environment in which the species are found and the surface components that provide the energy and clean water needed for survival.

B. Overutilization for commercial, recreational, scientific, or educational purposes:

Most *Pseudanophthalmus* species occur at only one or two locations. Most populations are extremely small; careless collecting, whether for scientific or other purposes, could adversely affect these populations. These species have no known commercial value; however, the caves in which these species occur may be used for recreational purposes by cavers and by casual cave visitors.

C. Disease or predation:

Disease or predation is not known to be a significant problem for the Clifton Cave beetle; however, since the species appears to exist with low numbers of individuals, mortality via either of these two factors may have a significant, negative impact on recruitment and long-term survival.

D. The inadequacy of existing regulatory mechanisms:

There are no existing regulatory mechanisms that protect the Clifton Cave beetle. It is not protected under Kentucky state law and is not afforded protection by any Federal statute or regulation.

E. Other natural or manmade factors affecting its continued existence:

Populations of *Pseudanophthalmus* species are restricted in distribution and are generally believed to be represented by small numbers of individuals. These characteristics make them extremely vulnerable to extirpation from (1) intentional or accidental toxic chemical spills, (2) non-point source pollutants, (3) alteration or closure of cave entrances that disrupt the natural flow of organic matter and can alter natural temperature and hydrologic regimes, and (4) excessive human disturbance (e.g., trampling, vandalism, building fires). Their small size and cryptic behavior also make them difficult to study, further complicating attempts at conservation. Small population sizes for these species limit the natural interchange of genetic material within each population. Unfortunately, it is possible that some of these beetle populations are below the effective population size required to maintain long-term genetic and population viability.

Conservation Measures Planned or Implemented :

The Kentucky Department of Fish and Wildlife Resources (KDFWR) in cooperation with the Service funded a status survey for the rarer cave beetles that occur in Kentucky (Barr 1996, pp. 1-63). A part of this survey included identification of owners of the caves supporting these species. In gathering the land ownership information needed for the final report on this cooperatively funded project (Barr 1996, pp. 11-55), the landowners were made aware of the presence of the rare cave beetles within caves on their land. In general, landowners were supportive of protecting these rare species.

Most of the owners of sites on which these cave beetle caves occur were contacted by Dr. Barr or those assisting him with survey activities to determine the status of these species. Most owners were pleased to learn of the presence of a rare species within their caves and are expected to be willing to assist with any protection activities needed to protect and recover these cave beetles. The KDFWR actively participated in gathering the information presented in Barr (1996, p. 60; 1998, p. 1) on the status of these species. It is anticipated that they will continue to support and participate in rare cave beetle protection.

Upon review of a draft of this assessment, Dr. Tom Barr (2010, pers. comm.) recommended several conservation actions for these cave systems. For Clifton Cave, he recommended that the cave be reopened and gated. The KYTC, KSNPC, and KFO attempted to reopen Clifton Cave in 2008, but the effort was unsuccessful.

Summary of Threats :

The Clifton Cave beetle is currently known from Clifton Cave and a small crawlway located about

one mile from Clifton Cave. Its limited distribution make it vulnerable to isolated events that would only have a minimal effect on the more wide-ranging members of the genus *Pseudanophthalmus*. Events such as toxic chemical spills, discharges of large amounts of polluted water, closure of entrances, alteration of entrances, or the creation of new entrances can have serious adverse impacts on this and other cave beetles and could result in their extinction. The closure of Clifton Cave has likely disrupted the flow of organic debris into the cave, which could have a negative effect on the species. We find that the Clifton Cave beetle is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

For species that are being removed from candidate status:

_____ Is the removal based in whole or in part on one or more individual conservation efforts that you determined met the standards in the Policy for Evaluation of Conservation Efforts When Making Listing Decisions(PECE)?

Recommended Conservation Measures :

Maintain/establish landowner contact. Establish/maintain conservation agreements or memoranda of understanding to ensure appropriate management of Clifton Cave. Construct gates or other appropriate barriers to control human access when necessary. Monitor population levels annually and search for additional populations. Monitor existing threats to the species and to Clifton Cave. Develop and implement plans to reduce or eliminate direct and indirect threats to the species. Continue annual status reviews of the species.

Priority Table

Magnitude	Immediacy	Taxonomy	Priority
High	Imminent	Monotypic genus	1
		Species	2
		Subspecies/Population	3
	Non-imminent	Monotypic genus	4
		Species	**5**
		Subspecies/Population	6
Moderate to Low	Imminent	Monotype genus	7
		Species	8
		Subspecies/Population	9
	Non-Imminent	Monotype genus	10
		Species	11
		Subspecies/Population	12

Rationale for Change in Listing Priority Number:

N/A

Magnitude:

The Clifton Cave beetle is currently known from only two sites. Its limited distribution makes it vulnerable to isolated events that would only have a minimal effect on the more wide-ranging members of the genus *Pseudanophthalmus*. Events such as toxic chemical spills, discharges of large amounts of polluted water, closure of entrances, alteration of entrances, or the creation of new entrances can have serious adverse impacts on this and other cave beetles and could result in their extinction.

Imminence :

The threats faced by this species are significant, however, it is not anticipated that they will be subject to these threats in the immediate future (next 1 to 2 years).

__Yes__ Have you promptly reviewed all of the information received regarding the species for the purpose of determination whether emergency listing is needed?

Emergency Listing Review

__No__ Is Emergency Listing Warranted?

Given the current status and the magnitude and imminence of the threats to this species,

emergency listing is not warranted at this time.

Description of Monitoring:

In fiscal year 2004, a cooperative agreement between the Kentucky State Nature Preserves Commission (KNSPC) and the Service funded a status survey of all formal candidate *Pseudanophthalmus* species in Kentucky. In 2005, KNSPC reported that there was no change in the status of the species and no new threats to their continued existence were identified during their surveys. A report on the KNSPC survey effort was produced in 2006 (Laudermilk 2006, pp. 1-15). The KFO plans to conduct surveys for all four of its candidate *Pseudanophthalmus* beetles in summer/fall 2013.

Indicate which State(s) (within the range of the species) provided information or comments on the species or latest species assessment:

none

Indicate which State(s) did not provide any information or comment:

Kentucky

State Coordination:

Kentucky did not include insects in its Wildlife Action Plan (KDFWR 2005); the only invertebrates included in the plan were freshwater mussels.

Literature Cited:

Barr, Thomas C. 1981. Pseudanophthalmus from Appalachian Caves (Coleoptera: Carabidae): The Engelhardti Complex. Brimleyana 5: 37-94.

Barr, Thomas C., 1996. Cave Beetle Status Survey and Prelisting Recovery Project. Unpublished Report to Kentucky Department of Fish and Wildlife Resources, Frankfort, Kentucky, and the U.S. Fish and Wildlife Service, Asheville, North Carolina. 63 pp.

Barr, Thomas C. 1998. Study of Potentially Threatened or Endangered Species of Cave Beetles in Tennessee, Alabama and Georgia. Interim Progress Report to the Tennessee Wildlife Resources Commission. 11 pp.

Barr, Thomas C. 2004. A classification and checklist of the genus Pseudanophthalmus Jeannel (Coleoptera: Carabidae: Trechinae). Virginia Museum of Natural History Special Publication 11. 52 pp.

Barr, Thomas C. 2010. Personal communication, email from Tom Barr regarding potential conservation efforts for Tatum Cave, Clifton Cave, and Icebox Cave. Nashville, Tennessee.

Kentucky Department of Fish and Wildlife Resources. 2005. Kentucky's Comprehensive Wildlife Conservation Strategy. KDFWR. Frankfort, Kentucky.

Krekeler, C. H. 1973. Cave Beetles of the Genus Pseudanophthalmus (Coleoptera: Carabidae) from the Kentucky Bluegrass and Vicinity. Fieldiana 62(4):35-83.

Laudermilk, Ellis L. 2006. A Survey for Kentucky Pseudanophthalmus (Coleoptera: Carabidae: Trichinae) Species Considered Candidates For Listing by the U. S. Fish and Wildlife Service. Kentucky State Nature Preserves Commission, Frankfort, Kentucky. 15 pp.

Laudermilk, Ellis L. 2009. Personal communication to Robert Currie, Fish and Wildlife Biologist (retired), Asheville Field Office, US Fish and Wildlife Service. Asheville, NC. January 26, 2009.

Approval/Concurrence:

Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:  08/04/2015
Date

Concur:  12/04/2015
Date

Did not concur: _____ _____
Date

Director's Remarks:

testing CNOR process